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EXAMINER
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PADGETT, MARIANNE L

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ELECTRONIC

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* PHILLIP L. WIMMER,  
CHARLES OTIS, and  
JOSHUA W. SMITH

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Appeal 2009-002823  
Application 10/052,815  
Technology Center 1700

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Decided: March 31, 2010

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Before MICHAEL P. COLAIANNI, BEVERLY A. FRANKLIN, and  
LINDA M. GAUDETTE, *Administrative Patent Judges*.

COLAIANNI, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134 the final rejection of claims 1-5, 7-21, 25, 26, and 33-36. We have jurisdiction over the appeal pursuant to 35 U.S.C. § 6(b).

We AFFIRM.

Appellants describe a method for preparing a surface for adhesion by using an initiator to shadow a surface and laser ablating the non-shadowed portions of the surface to form cones in the shadowed areas (Spec. 1:3).

Claims 1, 2, and 18 are illustrative:

1. A method of creating a bond between a substrate and an adhesive, the method comprising:

providing an initiator to a substrate, the initiator configured to shadow a portion of a surface of the substrate;

directing a laser toward the surface of the substrate to effect ablation of a non-shadowed portion of the substrate, forming structures on the surface of the substrate; and

applying an adhesive to the surface of the substrate after formation of the structures.

2. The method of claim 1, wherein providing an initiator includes resettling ablation debris, which results from the initial ablation of the surface of the substrate, on the surface of the substrate where the ablation debris has a higher ablation threshold than the surface of the substrate.

18. A method of bonding an adhesive to a substrate, the method comprising:

directing a laser at a surface of a substrate to cause ablation of the surface and formation of a first amount of ablation debris;

after formation of the first amount of ablation debris, adjusting the fluence of the laser between an ablation threshold of the substrate and an ablation threshold of the ablation debris;

after adjusting the fluence, further ablating the surface of the substrate so as to progressively cover the surface of the substrate with a second amount of ablation debris to effect formation of raised structures on the surface of the substrate; and

applying an adhesive to the surface of the substrate after formation of the structures.

The Examiner relies on the following prior art references as evidence of unpatentability:

Burns	5,172,473	Dec. 22, 1992
Murthy	6,120,131	Sep. 19, 2000
Brennen	US 2005/0242059 A1 <sup>1</sup>	Nov. 3, 2005

Taylor, R.S. et al., The effect of debris formation on the morphology of excimer laser ablated polymers, *J. Appl. Phys.* 64(5) 2815-2818, Sept. 1, 1988.

Krajnovich, D. J. et al., Formation of “intrinsic” surface defects during 248 nm photoablation of polyimide, *J. Appl. Phys.* 73(6) 3001-3008, Mar. 15, 1993.

The rejections provided by the Examiner are as follows:

1. Claims 1 and 8 are rejected under 35 U.S.C. § 102(b) as being anticipated by Burns.<sup>2</sup>
2. Claims 1-5, 7, 8, 10-16, 18-20, 33, and 36 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Brennen, optionally in view of Taylor.

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<sup>1</sup> The Examiner concomitantly refers to U.S. Patent 6,919,162 B1 issued to Brennen (e.g., Ans. 7), which is the patent corresponding to pre-grant publication US 2005/0242059. Because the disclosures appear to be the same and the Examiner does not rely on Brennen’s patent for any teaching different than the teachings found in the pre-grant publication, we refer to the pre-grant publication in the Decision.

<sup>2</sup> Appellants indicate that the 35 U.S.C. § 102(b) rejection over Burns is not being appealed (App. Br. 2 and 18). We view this action by Appellants as a waiver and affirm this rejection.

3. Claims 1-5, 7, 8, 10-16, 18-20, 33, and 36 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Burns, optionally in view of Taylor.
4. Claims 9, 17, 21, 25, 26, 34, and 35 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Brennen, optionally in view of Taylor, and further in view of Murthy.

Regarding rejections (2) and (3), Appellants argue claims 2, 10, 18, and 21. Appellants argue the same subject matter with regard to claims 2, 10, and 21, we select claim 2 as representative of the group. We also address Appellants' arguments regarding claim 18. 37 C.F.R. § 41.37(c)(1)(vii).

Regarding rejection (4), Appellants rely on the same arguments made regarding rejection (2). Accordingly, the claims under rejection (4) stand or fall with rejection (2).

### *REJECTION (2) and (3)*

### ISSUES

1. Did the Examiner establish that Brennen or Burns alone teaches or suggests using resettled ablation debris as the initiator for shadowing a surface of the substrate as required by claim 2?  
We decide this issue in the negative.
2. Have Appellants identified reversible error in the Examiner's determination that Brennen or Burns, in view of Taylor, would have suggested using resettled ablation debris as the initiator for shadowing a surface of the substrate as required by claim 2 or adjusting the laser fluence between the ablation threshold of the substrate and an ablation threshold of the ablation debris after

formation of the first amount of ablation debris as required by claim 18? We decide this issue in the negative for the combination of Brennan in view Taylor. We decide this issue in the affirmative for the combination of Burns in view of Taylor.

#### FACTUAL FINDINGS (FF)

1. The portion of Brennen relied on by the Examiner discloses that intrinsic feature definition depends on particular properties of the material being ablated and that cone formation occurs “when the fluence of a laser pulse at the substrate is not high enough to completely remove a whole layer of material” (¶ [0086]; Ans. 8-9). Brennen further discloses that even a “small particle of material that remains of the previous layer may be enough to initiate the formation of a cone . . . since this particle of material may not be removed by subsequent laser pulses but instead acts as sort of mask” (¶ [0086]). Brennen cites to the Krajnovich article as supporting this cone formation mechanism (¶ [0086]).
2. Brennen teaches that it is known to use laser ablation to roughen a surface and promote adhesion in the subsequent processing of the substrate (Brennen ¶ [0030]). Brennen uses a cleaning step to remove debris caused by the laser ablation process from the substrate (¶ [0091]).
3. Krajnovich teaches that cone formation results from the shadowing effect caused by radiation hardening of portions of the polymer (Krajnovich 3005-3006). Krajnovich explains that the radiation

hardened portions of the polymer are more difficult to remove at a particular laser fluence (i.e., they act like masks) and participate in cone formation (Krajnovich 3006-3007). Krajnovich does not disclose using resettled debris to form the cones.

4. Burns discloses a method of making an electrical interconnection comprised of an ablative material (col. 1, ll. 10-15; Abstract). Burns discloses that the conical projections of patentee's invention differ from randomly and irregularly shaped dendrites by the "controlled location and dimensions of conical projections" (col. 1, ll. 36-44; col. 2, ll. 5-6).
5. Burns further discloses that it is known that "irregular conical formations" may be obtained by laser ablation of polyimide (col. 3, ll. 6-14). Burns teaches that an object of the invention is to make electrical interconnects in an efficient and controllable manner (col. 4, ll. 13-16). Burns discloses that the controllable manner includes using a mask to "predetermine" the location of the conical projections in the polymer (col. 4, ll. 45-51). Indeed, Burns' Figures 1, 3, 4, 9a, 9b, 12a, and 13 all depict a uniform and regular pattern of cones.
6. Taylor investigates the cone formation process and determines that resettled debris on the surface may be the cause of the cones (Taylor 2817). Taylor teaches that using higher laser fluence may be used to remove the cones, where the cones are undesirable (Taylor 2817). In other words, Taylor does not teach away from forming cones by resettled debris. To the contrary, Taylor teaches that controlling the

laser fluence (i.e., a result effective variable) achieves the desired surface morphology (e.g., a smooth or cone-studded surface).

## ANALYSIS

### *Issues (1): § 103 over Brennen or Burns Alone*

Appellants argue that Brennen or Burns fails to teach or suggest shadowing a mask with laser ablation debris (App. Br. 12-14; 16-17). We agree.

The Examiner relies on Brennen's teaching that a small particle that remains of a previous layer may be used to form the cones and that debris is removed (Ans. 7; 8-9). Regarding Burns, the Examiner relies on the teaching that debris is removed as implying that the debris present during the laser ablation must be involved with the cone formation (Ans. 13). However, these findings alone are insufficient to suggest that one of ordinary skill in the art, based on Brennen's or Burns' teachings alone, would have used ablated debris to form the cones or that the debris inherently would have been involved in the cone formation process.

To the contrary, Brennen discloses that the intrinsic property of the material being ablated controls cone formation. Brennen explains via citation to the Krajnovich article that a portion of the previous layer that remains (i.e., was not ablated due to radiation hardening, for example) may be used as a mask to form the cones. Burns discloses using a mask to form the cones in a regular pattern.

Moreover, Brennen's and Burns' disclosure of debris removal steps does not necessarily mean that ablation debris is used to form cones. Indeed,



the disclosures of the references alone teach using the intrinsic properties of the material to be ablated or a mask to form the cones.

For these reasons, we reverse the Examiner's § 103 rejections of claims 2, 10-16, 18-20, and 36 over Brennen or Burns alone.

Because the Examiner does not rely on Murthy to cure the deficiencies of Brennen, we reverse the Examiner's § 103 rejection of claims 21, 25, and 26 over Brennen in view of Murthy.

Because Appellants do not provide any argument regarding claim 1 or the claims that depend therefrom, we summarily affirm the Examiner's § 103 rejection of claims 1, 3-5, 7, 8, and 33 over Brennen or Burns alone. We further summarily affirm the Examiner's § 103 rejection of claims 9, 34, and 35 over Brennen alone in view of Murthy.

*Issue (2): Brennen or Burns in view of Taylor*

Appellants argue that Brennen teaches away from using ablation debris to form cones and Taylor does not teach forming cones from ablation debris for the purpose of promoting adhesion (App. Br. 15). Appellants contend that Taylor teaches away from forming cones on surfaces (App. Br. 15).

Appellants argue that Burns and Taylor teach away from the present invention (App. Br. 17).

Regarding the Burns in view of Taylor rejection, we agree with Appellants that Burns teaches away from the combination. Burns teaches forming regular conical patterns at "predetermined" locations on a substrate by using a mask to form the conical patterns. In fact, Burns contrasts the regular, predetermined locations with the irregular and randomly positioned

locations using the prior art methods. Based on these Burns disclosures, we agree that Burns teaches away from using resettled ablated material to form randomly positioned cones, such as taught by Taylor.

For these reasons, we reverse the Examiner's § 103 rejection of claims 2, 10-16, 18-20, and 36 over Burns in view of Taylor. Because the ablative debris feature argued by Appellants is not present in claims 1, 3-5, 7, 8, and 33 and Appellants have proffered no additional arguments regarding the rejection of these claims, we summarily affirm the Examiner's § 103 rejection of claims 1, 3-5, 7, 8, and 33 over Burns in view of Taylor.

The rejection of Brennen in view of Taylor is on a different footing than the rejection of Burns in view of Taylor such that Appellants' arguments are unpersuasive. Brennen teaches that it is known in the art to control the laser intensity (i.e., fluence) to ablate a surface and promote adhesion. Brennen further teaches that intrinsic feature definition of a substrate depends upon the specific properties of the material being ablated and that coning may be achieved by using a remaining portion of the previous layer to act as a mask. Brennen recognizes that debris is formed and needs to be removed.

Taylor discloses that debris may be used to form cones on the surfaces and that the laser fluence may be controlled to form the cones if desired or remove the cones if undesired.

Accordingly, the teachings of the references as a whole would have suggested using ablated debris as taught by Taylor to form cones on the surface of Brennen's substrate. Such a combination appears to be nothing more than the predictable use of a prior art element (i.e., laser ablated debris)

according to its established function (i.e., forming cones to roughen a substrate surface).

Appellants' argument that Brennen's citation of Krajnovich teaches away from using ablated debris to form the cones is mistaken. Brennen's recognition of the "radiation hardening" cone formation mechanism disclosed by Krajnovich does not exclude or discourage using ablated debris to form the cones as disclosed by Taylor.

Similarly, Taylor's disclosure that the laser fluence may be controlled to remove the cones that form from ablated debris, does not discourage using the ablated debris to form cones. In fact, Taylor discloses that increasing the laser fluence is significant for "applications in which cones are undesirable" (Taylor at 2817), which plainly implies that there are applications where the cones may be desired. This Taylor disclosure does not constitute a teaching away as argued.

Appellants' arguments individually attack the teachings of the references instead of addressing what the combined teachings of Brennen and Taylor would have suggested to one of ordinary skill in the art. Using this proper standard, we agree with the Examiner that Brennen in view of Taylor would have suggested using ablated debris to form the cones and roughen the substrate surface.

With regard to claim 18, Appellants argue that Brennen in view of Taylor fail to teach or suggest adjusting the laser fluence after ablation debris has accumulated on the surface of the substrate (Reply Br. 4). However, this argument fails to address the Examiner's finding that Taylor teaches controlling the laser ablation parameters (e.g., laser fluences) to affect cone formation (Ans. 7). In other words, the Examiner determines

that controlling the laser fluence is a result-effective variable as taught by Taylor such that it would have been obvious to adjust the laser fluences to affect cone formation while not ablating the cone from the surface.

Appellants have not identified error in the Examiner's stated obviousness case for claim 18.

For the above reasons, we affirm the Examiner's § 103 rejection of claims 1-5, 7, 8, 10-16, 18-20, 33, and 36 over Brennen in view of Taylor.

Also, because Appellants make no separate arguments regarding the combination of Brennen in view of Taylor and Murthy other than to rely on the arguments noted above, we affirm the Examiner's § 103 rejection of claims 9, 17, 21, 25, 26, 34, and 35 over Brennen in view of Taylor and Murthy.

## DECISION

We reverse the § 103 rejection of claims 2, 10-16, 18-20, and 36 over Brennen or Burns alone.

We reverse the § 103 rejection of claims 17, 21, 25, and 26 over Brennen alone in view of Murthy.

We summarily affirm the Examiner's § 103 rejection of claims 1, 3-5, 7, 8, and 33 over Brennen or Burns alone.

We summarily affirm the Examiner's § 103 rejection of claims 9, 34, and 35 over Brennen alone in view of Murthy.

We reverse the Examiner's § 103 rejection of claims 2, 10-16, 18-20, and 36 over Burns in view of Taylor.

We summarily affirm the Examiner's § 103 rejection of claims 1, 3-5, 7, 8, and 33 over Burns in view of Taylor.

Appeal 2009-002823  
Application 10/052,815

We affirm the Examiner's § 103 rejection of claims 1-5, 7, 8, 10-16, 18-20, 33, and 36 over Brennen in view of Taylor.

We affirm the Examiner's § 103 rejection of claims 9, 17, 21, 25, 26, 34, and 35 over Brennen in view of Taylor and Murthy.

The Examiner's decision is affirmed.

#### TIME PERIOD

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv)(2009).

ORDER

AFFIRMED

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